Available online at www.sciencedirect.com
SCIENCE DIRECT®
COGNITION
ELSEVIER
Cognition 98 (2006) B75–B87
www.elsevier.com/locate/COGNIT

Brief article

When English proposes what Greek presupposes: The cross-linguistic encoding of motion events

Anna Papafragou[a,*], Christine Massey[b], Lila Gleitman[b]

[a]*Department of Psychology, University of Delaware, 109 Wolf Hall, Newark DE 19716, USA*
[b]*Institute for Research in Cognitive Science, University of Pennsylvania, 3401 Walnut St., Suite 400A, Philadelphia PA 19104, USA*

Received 22 April 2004; revised 5 January 2005; accepted 2 May 2005

Abstract

How do we talk about events we perceive? And how tight is the connection between linguistic and nonlinguistic representations of events? To address these questions, we experimentally compared motion descriptions produced by children and adults in two typologically distinct languages, Greek and English. Our findings confirm a well-known asymmetry between the two languages, such that English speakers are overall more likely to include manner of motion information than Greek speakers. However, mention of manner of motion in Greek speakers' descriptions increases significantly when manner is not inferable; by contrast, inferability of manner has no measurable effect on motion descriptions in English, where manner is already preferentially encoded. These results show that speakers actively monitor aspects of event structure, which do not find their way into linguistic descriptions. We conclude that, in regard to the differential encoding of path and manner, which has sometimes been offered as a prime example of the effects of language encoding on nonlinguistic thought, surface linguistic encoding neither faithfully represents nor strongly constrains our mental representation of events.

Keywords: Motion; Space; Event cognition; Language production; Pragmatics; Whorf; Greek

1. Introduction

How do humans talk about what they see? And what is the relationship between linguistic and conceptual event structure? In some obvious sense, the linguistic

* Corresponding author.
E-mail address: papafragou@psych.udel.edu (A. Papafragou).

0022-2860/$ - see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.cognition.2005.05.005

expression of events draws from and is constrained by basic, probably universal, elements of cognitive event structure. For instance, human motion cognition isolates and attends to manner and direction of motion, intention and causation, agency and affectedness: and indeed, the corresponding meaning elements reliably show up in the linguistic encoding of events cross-linguistically. But within this broad space of meaning distinctions, individual languages are notoriously choosy in how they encode motion event structure. To take one famous example, the segmentation and packaging of path and manner of motion are characterized by intense typological variability. As originally pointed out by Talmy (1975), English includes a large inventory of manner verbs (*strut*, *bounce*, *slide*, *stroll*, *sashay*, etc.) which can be freely combined with adverbs, particles or prepositional phrases encoding trajectory information (*away*, *into the forest*, *upwards*, etc.). English path verbs (*enter*, *exit*, *descend*, etc.) are fewer in number and more restricted in distribution. By contrast, a language like Greek mostly expresses motion information in path verbs (*beno* 'enter', *vjeno* 'exit', *perno* 'cross', *pao* 'go', etc.) combined with prepositional phrases or adverbials which further specify path (*sto spiti* 'into the house', *makria* 'away', etc.). Even though ordinary manner of motion verbs exist in Greek (*sernome* 'crawl', *perpato* 'walk', *peto* 'fly', etc.), their distribution is more restricted than in English (cf. Aske, 1989; Jackendoff, 1990; Levin, 1985; Levin & Rappaport Hovav, 1992; Slobin & Hoiting, 1994; Talmy, 1985; 2000). Specifically, Greek canonically disallows the co-occurrence of a manner-of-motion verb with a path PP within the same clause when the motion event involves some sort of change of state or result. Thus Greek, unlike English, lacks the option of linguistically packaging complex motion events in the compact way given in (1).[1]

Mary	flew	to	Paris.
FIGURE	MOTION + MANNER	PATH	GROUND

(1)

In such cases, Greek can encode manner-of-motion information in modifiers ('Mary went to Paris by plane') or separate clauses ('Mary took a plane and went to Paris') but speakers often opt to omit mention of manner altogether as in (2).

I Maria	pige	to	Paris.
'the-Mary	went	to	Paris'
FIGURE	MOTION + PATH	PATH	GROUND

(2)

These asymmetries in path-manner encoding are cross-linguistically pervasive. English is characteristic of what we will call *Manner* languages (cf. also German, Russian, Chinese), where manner of motion is typically encoded in the main verb, while Greek patterns alongside other *Path* languages (e.g. French, Spanish, Turkish), in which the verb usually encodes the trajectory (path) of motion. Manner languages are characterized by large, massively used and often growing (that is, productive) manner

[1] In both languages, *Mary flew towards Paris* (directional, no change of state) is grammatical. On the possible roots of the constraint in Path languages, see Aske (1989); Jackendoff (1990); Levin and Rapoport (1988); Narasimhan (1998), among others.

verb vocabularies, whereas in Path languages manner is less salient as a grammaticalized feature. These cross-linguistic differences have been confirmed in psycholinguistic studies of motion with both adults and children (Allen, Özyürek, Kita, Brown, Turanli & Ishizuka, 2003; Choi & Bowerman, 1991; Naigles, Eisenberg, Kako, Highter & McGraw, 1998; Özçalişkan & Slobin, 1999; Papafragou, Massey & Gleitman, 2002; Sebastián & Slobin, 1994; Slobin, 1996; 2003).

In this article, we address the question whether cross-linguistic variability in motion event encoding affects the way speakers of different languages represent motion scenes nonlinguistically. There is evidence that such linguistic differences exert strong, almost automated pressures on language production on-line. Particularly, several production models incorporate the idea that language-specific demands on the formulation of messages have become automatized in adult speakers and shape the preparation of encodable messages even before the activation of specific lexical items (Levelt, 1989). Similarly, in language acquisition, the mobilization of linguistic resources in preparation for speech is assumed to be affected by knowledge of what is normally encoded in the language (Berman & Slobin, 1994; Choi & Bowerman, 1991). Given these strong encoding preferences, and because the format of cognitive representations must interface with language-specific requirements if these representations are to be usable in communication, several researchers have concluded that those elements of spatial scenes and events which typically find their way into language may be cognitively "privileged". At minimum, it is argued, to the extent that speech must be framed in compliance with language-specific grammatical and lexical strictures, there is a sense in which speakers of different languages must be thinking differently at the moment of utterance—at least to the degree that their languages differ. Slobin (1996) has called this language-specific mobilization of linguistic resources "thinking for speaking." In the case of motion, this means that manner components are in differential states of conceptual readiness in the minds of speakers of Manner vs. Path languages immediately prior to verbalization (cf. Bowerman & Choi, 2004).

According to a second, stronger, proposal, typological differences in event encoding might have deeper effects on cognition. For instance, Berman and Slobin (1994) have hypothesized that the difference in language typologies of motion lead their speakers to different cognitive analyses of the scenes that they inspect. In the words of these authors, "…children's attention is heavily channeled in the direction of those semantic distinctions that are grammatically marked in the language" (Berman & Slobin 1994, p. 622; Choi & Bowerman, 1991). If true, this would mean that manner details of motion scenes might be remembered better or might be used as a categorization tool more readily by speakers of languages where manner information is regularly grammaticalized in the verb repertory. More generally, this position entails that the systematic and repeated expression of certain aspects of spatial scenes and events in language might direct the habitual thought patterns of language users to just these distinctions over others (for discussion, see Bloom, Pederson, Nadel & Garrett, 1996; Bowerman and Levinson, 2001; Gentner & Goldin-Meadow, 2004; Levinson, 1996; 2003; Li & Gleitman, 2002; Pederson, Danziger, Wilkins, Levinson, Kita & Senft, 1998; among others).

In order for language to have such effects on nonlinguistic cognition, the conceptual representation of events should, at least on some level, be isomorphic to their linguistic (syntactic-semantic) representation. The more closely linguistic (semantic) encoding

indexes the conceptual encoding of scenes and events, the more likely it is that cross-linguistic differences in event encoding might have detectable, longer-term effects on aspects of event cognition (e.g. memory and categorization). These assumptions, however, seem at odds with the fundamental fact that human communication is wildly inferential: we know from decades of research in pragmatics that information that is linguistically *communicated* goes well beyond information that is linguistically *encoded*. In other words, what speakers say typically falls short of what they have in mind and want to convey to listeners (Sperber & Wilson, 1986; Carston, 2002; for discussion, Gleitman & Papafragou, 2005; Papafragou, 2004). Given the physical and temporal constraints of human verbal interactions, speakers constantly need to make decisions about what to encode linguistically and what to leave unexpressed. Such decisions are crucially mediated by non-linguistic factors such as informativeness or expectations about the specific demands of the conversational exchange, and often rely on the hearer's ability to recover aspects of what the speaker meant through inference. Information encoded linguistically, then, is simply a pointer to much richer conceptual representations; rather than being constrained by the linguistic content of utterances, hearers can complete, expand, or otherwise enrich this content to arrive at what speakers meant.

There is experimental evidence that speakers anticipate hearer inferences when preparing event descriptions. In a classic demonstration, Brown and Dell (1987) found that, in retelling a story, people were more likely to mention atypical (hence non-inferable) instruments for actions than typical ones (e.g. icepicks were more likely to be mentioned than knives in stabbing incidents). More recently, it has been shown that such effects of inferability/typicality can be attributed to genuine on-line monitoring of addressee knowledge and not simply to adjustment of one's speech to the potential needs of a generic addressee (Lockridge & Brennan, 2002). Listeners too seem to routinely go beyond linguistic aspects of heard descriptions in inferentially reconstructing the details of spatial scenes and events. For instance, people interpret a verb such as *approach* differently depending on details of the moving object, its target location, the speed of motion and its purpose (cf. *A nun is just approaching the cathedral/the statue*; *A luxury liner/sailboat is just approaching the end of the dock*: Morrow & Clark, 1988; see Braun, 1976; Darbelnet, 1977; Talmy, 1985 for related linguistic observations). Taken together, these results confirm the conclusion that surface linguistic encoding neither faithfully represents nor strongly constrains our underlying thoughts in ordinary communication.

For these reasons, the inferential presuppositions of speech events need to be closely examined when considering potential effects of linguistic spatial encoding on nonlinguistic thinking. To date, however, the role of inference in the formulation of event descriptions has largely been overlooked in the psycholinguistic literature. In the study next described, we seek to bridge this gap by addressing both typological and pragmatic-inferential contributions to linguistic event structure. Our study focuses on linguistic descriptions of motion events by adults and child native speakers of English and Greek and asks how pragmatic requirements (e.g. the omission of easily inferable information) interface with lexical–structural properties of manner expression in these two different languages. One plausible hypothesis is that speakers of Greek might be less likely to include manner-of-motion information if it is inferable from other aspects of the linguistic description or the extra-linguistic knowledge of the hearer (cf. Brown & Dell, 1987). For instance, a speaker

who knows that Mary (who lives in Italy) is planning to visit the States can safely say *Mary will go to the States* and let the hearer infer that she will use the normal way of crossing the Atlantic (i.e. she will fly). If Mary decided to travel by ship instead, the speaker might be more likely to describe this event by mentioning the manner in her description. It is reasonable to expect that a distinction between inferable and non-inferable kinds of manner might create asymmetries in the encoding of manner in languages such as Greek where manner is otherwise not verbally prominent. By contrast, differences in inferability of manner should not affect verbal descriptions of motion in English, where manner is usually already encoded in the verb.

The study of inferability effects can throw new light on the discussion of language-thought relations. Specifically, within-language encoding flexibility, to the degree that it exists in speakers of Greek and other Path languages, cuts in the opposing direction from language-on-thought effects. If speakers pervasively, and relatively effortlessly, adjust their event descriptions in accordance with ambient extra-linguistic (communicative) pressures, to that extent they are liberated from the constraints and typical choices of a particular language: "speaking from thinking" rather than "thinking for speaking." More concretely, to the extent that Greek speakers systematically monitor the inferability of manner information and adjust their verbal descriptions of motion accordingly, neither their on-line nor their 'habitual' representation of motion scenes can be tightly constrained by the low overall salience of manner of motion in the verb typology of their language.

2. Experiment

2.1. Participants

Participants were monolingual native speakers of English or Greek who fell into two age groups: the child group consisted of 22 Greek-speaking 8-year-olds (range 7;2–9;2 years; mean 8;4) and 14 English-speaking 8-year-olds (range 7;5–10;0 years; mean 8;11). The adults were 21 Greek-speakers and 20 English speakers.

2.2. Materials and procedure

Materials consisted of a picture-book containing 24 motion scenes (see Appendix). We used a sequence of three digital color photographs to depict the beginning, the mid-point and the endpoint of each motion episode (e.g. an airplane flying over a barn). Our motion events were chosen so as to represent familiar everyday actions but also involved certain complex manner-path scenes (e.g. sneaking). All events involved self-initiated (spontaneous) motion.

Participants were asked to describe the depicted events. No restrictions were placed on the type of verbal description required and most participants gave a one- or two-utterance response.[2]

[2] These data were initially collected as part of Experiment 2 in Papafragou et al. (2002). The earlier paper reported the distribution of path vs. manner verbs in a subset of the items.

2.3. Coding and results

2.3.1. Event segmentation and lexicalization: Path vs. Manner verbs

Main verbs in the subjects' responses were coded as Manner, Path or Other (non-motion) verbs. If a response was a combination of Path and Manner verbs, it was coded as Other. Inspection of Fig. 1 reveals that the likelihood of expressing manner information depends both on subject age and on the language spoken.

To assess these results statistically, we created a dependent variable by summing the proportion of scenes for which the main verb was coded as Manner. This variable was then entered into a two-way ANOVA with Language Group (English vs. Greek) and Age Group (Children vs. Adults) as the independent variables. The analysis revealed a main effect of Language Group ($F(1,73) = 205.60$, $p < .0001$), with English speakers using Manner verbs 69% of the time compared to 22.5% for the Greek speakers. There was also a main effect of Age Group ($F(1,73) = 38.71$, $p < .0001$): adults used overall more Manner verbs in describing the motion scenes than children did (58.4% vs. 44.5% of responses respectively). The Language Group by Age Group interaction yielded a significant effect ($F(1,73) = 7.53$, $p = .0076$). The interaction can be explained in terms of the tendency of English-speaking adults to use more Manner verbs than the English-speaking children (80 vs. 54% of responses respectively), while Greek speakers did not differ in the frequency of Manner V usage across ages (16 vs. 28% for adults and children respectively). English-speaking 8-year-olds used fewer Manner Vs than English-speaking adults but more Manner Vs than Greek speakers of either age group.

A corresponding analysis was performed using the proportion of Path Vs used by each subject as the dependent variable. There was a main effect of Age Group ($F(1,73) = 46.48$, $p < .0001$), with adults overall using fewer Path Vs than children (44.8% compared to 72.8%); a main effect of Language Group ($F(1,73) = 24.23$, $p < .0001$), with Greek speakers using more Path Vs than English speakers (64.1 vs. 25.5%, respectively); but no interaction ($F(1,73) = 0.21$, $p = .6452$). The proportion of Path Vs in the speech of English children vs. adults was 37 vs. 20% respectively; for Greek, the corresponding figures are 66 and 60%. Overall, then, these results confirm findings in the literature which have documented an asymmetry in the use of Manner and Path Vs in English and Greek speakers.

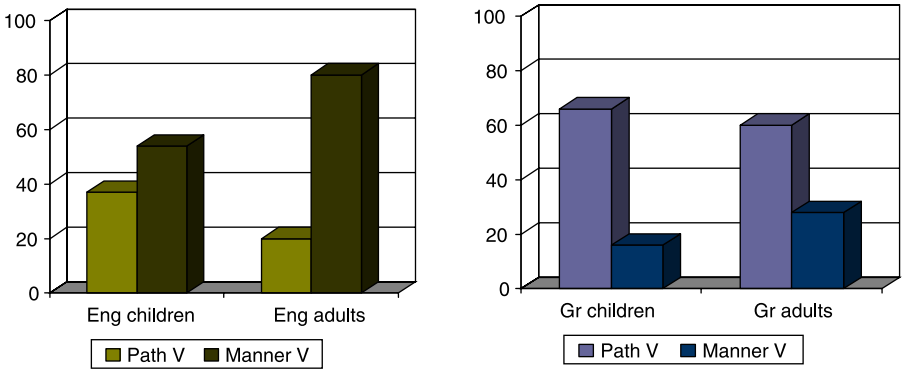

Fig. 1. Distribution of Path and Manner Vs.

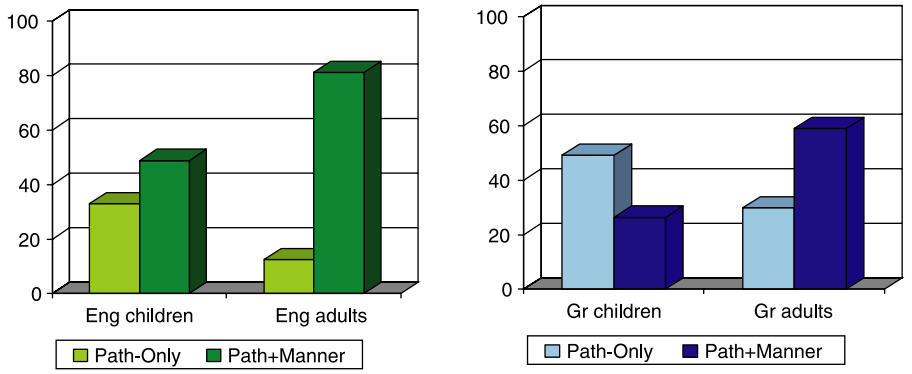

Fig. 2. Path and Manner information beyond the main V.

2.4. Event segmentation and clause structure

Most prior studies of the Path/Manner verb distinction across languages analyze their subjects' (or corpus) characteristics in terms of the semantics of the main verb, as we just did. We next asked whether the usage patterns cross-linguistically continued to differ when semantic information beyond the main verb is also considered. This analysis looked at the total amount of information contained in each subject's response including Path and Manner Modifiers. Path Modifiers consisted of source, goal and extent/route nominals (*He's leaving THE ROOM*), as well as adverbials and particles/prepositions (*He's going AWAY*) and PPs denoting source, goal, etc. (*He's going INTO THE ROOM*). Manner Modifiers included Manner PPs, adverbials and gerunds (*He's walking WITH CARE/QUICKLY/DRAGGING HIS FEET*). The result was a coding scheme with three categories: Path-Only, Manner-Only or Mixed. Path-Only responses included a Path V (*He entered*), or a Path V with a Path Modifier (*He went up*). Manner-Only descriptions involved a Manner V (*He's running*), sometimes together with a Manner Modifier (*He's running quickly*). Finally, Mixed descriptions included cases in which a Path V appeared with a Manner Modifier (*He came running*), a Manner V was combined with a Path Modifier (*He walked in*), or both a Manner and a Path verb were used in a multi-clause response which may have contained other Modifiers (*He entered and fell*).[3] The proportion of Manner-Only responses was very low (4.3 and 6.7% of English and Greek responses respectively), so we focus on the other two categories. The coding results are shown in Fig. 2, which again shows effects of both age and language.

To test for the significance of the Fig. 2 results, we entered the proportion of Path-Only responses into a two-way ANOVA with Language Group (English vs. Greek) and Age Group (Children vs. Adults) as the independent variables. The analysis revealed a main effect of Language Group ($F(1,73) = 24.23$, $p < .0001$), with English speakers using fewer Path-Only responses compared to the Greek speakers (21.4 vs. 40.6%, respectively). There

[3] We excluded from this analysis those verbal responses which included strings of Path Vs (or similarly Manner Vs) distributed over multiple clauses which may or may not have included other modifiers.

was also a main effect of Age Group ($F(1,73) = 46.48$, $p < .0001$): adults used overall fewer Path-Only strings in describing the motion scenes than children did (20.4 vs. 41.6% of responses). This time the Language Group by Age Group interaction did not yield a significant effect ($F(1,73) = 0.21$, $p = .6452$).

We conducted a similar analysis on the Mixed responses. This new analysis revealed a main effect of Language Group ($F(1,73) = 34.04$, $p < .0001$), with English speakers combining path and manner information in their responses 67.6% of the time compared to 43.2% for Greek speakers. There was also a main effect of Age Group ($F(1,73) = 99.09$, $p < .0001$). Adults used more Mixed responses in describing the motion scenes than children did (70.8 vs. 37% of responses respectively). The Language Group by Age Group interaction yielded no significant effect ($F(1,73) = 0.20$, $p = .6516$). We conclude that Greek speakers are more likely to omit manner and give exclusively path information in describing motion than English speakers. This is especially true of Greek-speaking children.

2.5. Beyond the clause: inferable aspects of event structure

The two previous analyses gave us a picture of how our Greek and English speakers expressed themselves when describing location and motion scenes. The results yielded a distinction that is potentially puzzling. English speakers, increasingly over age, provide more linguistic information (both path and manner) than do Greek speakers, who very often settle for the path description omitting any mention of the manner. In the analyses that follow, we ask whether these linguistic behaviors, cross-linguistically, are as different as they seem on the surface to be. As we will try to show, this depends on whether we take account of the information content latent in the inferential surroundings of speech events.

Specifically, we now investigate whether the *inferability* of manner of motion affects the content of the participants' descriptions. It could be that Greeks leave out manner specifications primarily where these can be assumed to be "obvious" to listeners. If so, they may in effect be conveying the same material as English speakers, only not explicitly.

To investigate this issue, we split the motion scenes into two groups depending on whether manner of motion in the scene was *inferable* or *opaque*. The 'Inferable manner' group included scenes in which manner was predictable even if not linguistically encoded (cf. scenes 2, 6, 7, 9, 18, 22 and 23 in the Appendix). One such example was a scene in which a man was walking up the stairs: even if no manner of motion information is given in the scene's description (e.g. 'A man is going up/ascending the stairs'), the hearer can straightforwardly reconstruct the relevant manner details (walking) in the mental representation of the event. By contrast, in the 'Opaque manner' group, the manner profile of the motion event could not be reconstructed in the absence of linguistic information (cf. scenes 1, 3–5, 8, 10, 11, 13, 15–17, and 19–21). For instance, in a scene in which a man is running down a hallway, this manner is not predictable from what else we know about the agent and the ground.[4] It is more typical of men to go by walking than to go by running. The dependent variable again was the proportion of participants' verbal responses that included

[4] Scenes 12, 14 and 24 were excluded from the analysis because they included Manner modifiers which contrasted the scenes to previous scenes the subjects had seen (*Here he is walking normally*).

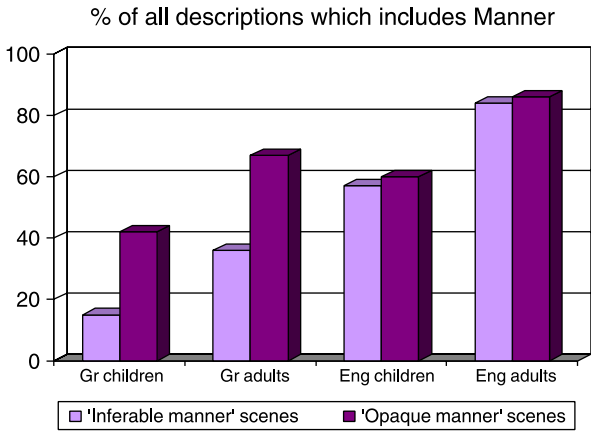

Fig. 3. Effects of inferability on motion descriptions.

manner information. Fig. 3 shows the frequency of verbal responses that included manner information as a function of inferability, by age- and language-groups. Inspection of the Figure reveals the predicted strong effect of the inferability variable on the usage of Greek speakers (child and adult) but not English speakers.

To assess these effects quantitatively, we entered the proportion of responses that included manner information into a repeated measures analysis with Age Group and Language Group as between-subjects variables, and Scene Type (Manner Inferability vs. Opaqueness) as a within-subjects variable. The analysis revealed a main effect of Age Group ($F(1,73)=66.53$, $p<.0001$): older subjects were more likely to include manner information in their descriptions. There was also a main effect of Language Group ($F(1,73)=75.06$, $p<.0001$): English speakers were more likely to include manner information than Greek speakers. No significant Age by Language Group interaction was found ($F(1,73)=0.2994$, $p=.5858$).

The within subjects analysis revealed a main effect of Scene Type ($F(1,73)=109.73$, $p<.0001$). Interestingly, there was a significant Scene Type by Language Group interaction ($F(1,73)=70.35$, $p<.0001$): Greek speakers were much more likely to adjust their descriptions depending on whether manner was inferable or unpredictable. There was also a significant Scene Type by Age Group interaction ($F(1,73)=4.37$, $p=.0399$) but no Scene Type by Age Group by Language interaction ($F(1,73)=3.04$, $p=.0852$).[5]

Summarizing these results, Greek speakers are more likely than English speakers to adjust their verbal description of motion to include manner information when this type of information is not inferable from the rest of their linguistic description. English speakers

[5] It turns out that effects of inferability/typicality can be observed in the small proportion of Manner-Only responses (mostly consisting of a single manner verb). In Greek, 72.6% of these descriptions occur in manner-opaque scenes, where manner is by definition noteworthy, where in English, the corresponding figure is 63%. This is what one should expect given the preference to encode manner information in the English verb. In both languages, however, if speakers are to mention manner alone, this is more likely to happen in cases of atypical/salient manner of motion.

do not need to make such adjustments because their verbal descriptions almost always encode manner. Even though the child subjects, in both language groups, were less successful in appropriately adding manner information, they too were sensitive to such language-specific aspects of message preparation.[6] As we and others have previously documented, the ultimate cause of this cross-linguistic pattern is the large difference in highly frequent and widely applicable manner verbs available in the two languages: indeed, even in the scenes where manner is not inferable, English speakers express manner via the verb 71% of the time while Greek speakers do so significantly less often (40.70%; $p < .0001$), the rest of the time inserting a manner modifier to an utterance with a path V.

3. General discussion

As we remarked in the introduction to this paper, models of language production assume that language-specific demands on the formulation of messages (e.g. path/manner encoding in the verb) have become automatic in adult speakers and shape the preparation of encodable messages even before the activation of specific lexical items (Levelt, 1989). Similarly, in language acquisition, the mobilization of linguistic resources in preparation for speech is assumed to be affected by knowledge of what is normally encoded in the language (Berman & Slobin, 1994; Choi & Bowerman, 1991). The motion event descriptions reported above confirm what must be strong cross-linguistic differences in such planning preferences. For instance, as Levelt remarked (1989, p. 106), 'it is irrelevant whether [obligatorily marked grammatical information] is of any communicative value': the formulator will include such information in the structure of the linguistic message. The pervasive use of manner verbs in English, regardless of whether manner is inferable or not, offers a clear demonstration of such automated choices for the linguistic formulator. Our findings also suggest that young speakers are already sensitive to a considerable degree to such language-specific constraints on event encoding.

Other aspects of our data, however, show that the precise shape of verbal messages is crucially affected by extra-linguistic pressures. In other words, aspects of visual scenes that are not typically encoded in some language (e.g. manner of motion in Greek) can be monitored and included selectively when their omission would be misleading for the hearer. Typically, Greek presupposes manner details, which English asserts—but where the presupposition is not obvious, then both languages express manner overtly. This suggests that such surface differences in the informational content of utterances as do exist cross-linguistically are heavily mitigated by inferential structure. Relevant content is

[6] Many questions have been left unstudied and unmentioned by this first examination. One has to do with the degree to which Greek speakers are monitoring inferability by actively taking into account addressee knowledge, rather than simply adjusting the richness of the message to a generic addressee (for discussion, see Lockridge & Brennan, 2002). It is plausible that, say, human acts of hopping are more likely than kangaroo acts of hopping to be marked as such in Greek, regardless of listener characteristics, just because these gait types vary in typicality for the named animals. But it is also likely that such usages are to some degree tailored "on line" to the inferred expertise of the listeners—more manner information expressed concerning hopping, say, to Frenchmen and Balinese than to Australians, during kangaroo conversations.

omitted from the utterance as a function of specific language design, to be sure; but often where the speaker knows that the listener will reconstruct it on the spot.

Such results bear on recently revived linguistic-relativistic hypotheses which take typological differences among languages to be important potential sources of cognitive differences among language users. Our study shows that speakers attend to more distinctions than they can (or will) encode linguistically. This suggests that surface linguistic representations of events cannot be taken too literally as indices of how speakers of any language are mentally representing aspects of their reference world. In prior work from several laboratories, it has been shown that speakers of Manner and Path languages behave much the same way in memory and categorization tasks despite systematic linguistic differences (Gennari, Sloman, Malt & Fitch, 2002; Papafragou et al., 2002; and for related results with other linguistic properties, Malt, Sloman, Gennari, Shi & Wang, 1999; Munnich, Landau & Dosher, 2002). The present findings show, as well, that not every surface difference should be taken as an argument for an on-line (in the instance) or long-term (how you come to think) difference in thought as a function of language spoken. Here, as elsewhere, what you see (in language) is not always what you get (in thought).

Acknowledgements

This research was partly supported by NRSA grant #F32MH06020 from NIH to Anna Papafragou and by NIH grant #1-R01-HD37507 to John Trueswell and Lila Gleitman. We thank Dana Septimus for her coding help.

Appendix A. Appendix

A.1. Experimental scenes

1 A man is stumbling into a room
2 A man is entering a room
3 A man is stumbling down the stairs
4 A man is jumping into a room
5 A man is jumping off a chair
6 A man is walking into a room
7 A man is going down the stairs
8 A man is sliding down the stairs
9 A man is walking to the bookcase
10 A man is running up the stairs
11 A man is running down the hall
12 A man is walking up the stairs
13 A dog is driving through a barn
14 A dog is walking through a barn
15 A dog is driving past a barn
16 A man is sneaking out of a room

17 A man is sneaking into a room
18 A man is walking out of a room
19 A man is jumping off the stairs
20 A man is falling off the stairs
21 A man is jumping on a couch
22 An airplane is flying over a barn
23 An airplane is flying around a barn
24 An airplane is flying upside down over a barn

References

Allen, S., Özyürek, A., Kita, S., Brown, A., Turanli, R., & Ishizuka, T. (2003). *Early speech about manner and path in Turkish and English: Universal or language-specific? BUCLD 27 proceedings.* (pp. 63–72). Somerville, MA: Cascadilla Press.

Aske, J. (1989). Path predicates in English and Spanish: A closer look. *Proceedings of the Fifteenth Annual Meeting of the Berkeley Linguistics Society* (pp. 1–14). Berkeley, CA: BLS.

Berman, R., & Slobin, D. (Eds.). (1994). *Relating events in narrative: A cross-linguistic developmental study*. Hillsdale, NJ: Erlbaum.

Bloom, P., Peterson, M., Nadel, L., & Garrett, M. (Eds.) (1996). *Language and space*. Cambridge, MA: MIT Press.

Bowerman, M., & Choi, S. (2004). Space under construction: Language-specific spatial categorization in first language acquisition. In D. Gentner, & S. Goldin-Meadow (Eds.), *Language in mind* (pp. 387–427). Cambridge, MA: MIT Press.

Bowerman, M., & Levinson, S. (Eds.). (2001). *Language acquisition and conceptual development*. Cambridge: Cambridge University Press.

Braun, T. (1976). Motion and change of place in French and English verbs. *The French Review*, *49*, 388–392.

Brown, P., & Dell, G. (1987). Adapting production to comprehension: The explicit mention of instruments. *Cognitive Psychology*, *19*, 441–472.

Carston, R. (2002). *Thoughts and utterances: The pragmatics of explicit communication*. Oxford: Blackwell.

Choi, S., & Bowerman, M. (1991). Learning to express motion events in English and Korean: The influence of language-specific lexicalization patterns. *Cognition*, *41*, 83–122.

Darbelnet, J. (1977). *Pensée et structure* (2nd ed.). New York: Scribners.

Gennari, S., Sloman, S., Malt, B., & Fitch, T. (2002). Motion events in language and cognition. *Cognition*, *83*, 49–79.

Gentner, D., & Goldin-Meadow, S. (Eds.). (2004). *Language in mind*. Cambridge, MA: MIT Press.

Gleitman, L., & Papafragou, A. (2005). Language and thought. In K. Holyoak, & R. Morrison (Eds.), *Cambridge handbook of thinking and reasoning* (pp. 633–661). Cambridge: Cambridge University Press.

Jackendoff, R. (1990). *Semantic structures*. Cambridge, MA: MIT Press.

Levin, B. (1985). *English verb classes and alternations*. Chicago: University of Chicago Press.

Levin, B., & Rappaport Hovav, M. (1992). The lexical semantics of verbs of motion: the perspective from unacusativity. In I. Roca (Ed.), *Thematic structure: Its role in grammar* (pp. 247–269). Berlin: Foris.

Levelt, W. (1989). *Speaking: From intention to articulation*. Cambridge, MA: MIT Press.

Levin, B., & Rapoport, T. (1988). *Lexical subordination. Papers from the Twenty-Fourth Regional Meeting of the Chicago Linguistics Society* (pp. 77–108). Chicago, IL: University of Chicago.

Levinson, S. (1996). Frames of reference and Molyneux's question: Crosslinguistic evidence. In P. Bloom, M. Peterson, L. Nadel, & M. Garrett (Eds.), *Language and space* (pp. 109–170). Cambridge, MA: MIT Press.

Levinson, S. (2003). *Space in language and cognition*. Cambridge: Cambridge University Press.

Lockridge, C., & Brennan, S. (2002). Addressees' needs influence speakers' early syntactic choices. *Psychonomic Bulletin and Review*, *9*, 550–557.

Li, P., & Gleitman, L. (2002). Turning the tables: spatial language and spatial cognition. *Cognition, 83*, 265–294.

Malt, B., Sloman, S., Gennari, S., Shi, M., & Wang, Y. (1999). Knowing versus naming: Similarity and the linguistic categorization of artifacts. *Journal of Memory and Language*, *40*, 230–262.

Morrow, D., & Clark, H. (1988). Interpreting words in spatial descriptions. *Language and Cognitive Processes*, *3*, 275–291.

Munnich, E., Landau, B., & Dosher, B. (2001). Spatial language and spatial representation: A cross-linguistic comparison. *Cognition*, *81*, 171–208.

Naigles, L., Eisenberg, A., Kako, E., Highter, M., & McGraw, N. (1998). Speaking of motion: Verb use in English and Spanish. *Language and Cognitive Processes*, *13*, 521–549.

Narasimhan, B. (1998). *The encoding of complex events in Hindi and English*. Doctoral dissertation, Boston University.

Őzçalişkan, S., & Slobin, D. (1999). *Learning how to search for the frog: Expression of manner of motion in English, Spanish, and Turkish. BUCLD Proceedings*. Somerville, MA: Cascadilla Press.

Papafragou, A. (2004). Review of R. Carston, *Thoughts and utterances. Lingua*, *114*, 621–628.

Papafragou, A., Massey, C., & Gleitman, L. (2002). Shake, rattle, 'n' roll: the representation of motion in language and cognition. *Cognition*, *84*, 189–219.

Pederson, E., Danziger, E., Wilkins, D., Levinson, S., Kita, S., & Senft, G. (1998). Semantic typology and spatial conceptualization. *Language, 74*, 557–589.

Sebastián, E., & Slobin, D. (1994). Development of linguistic forms: Spanish. In R. A. Berman & D. I. Slobin (Eds.), *Relating events in narrative: A cross-linguistic developmental study*. (pp. 239–284). Hillsdale, NJ: Erlbaum.

Slobin, D. (1996). From 'thought and language' to 'thinking for speaking'. In J. Gumperz, & S. Levinson (Eds.), *Rethinking linguistic relativity* (pp. 70–96). New York: Cambridge University Press.

Slobin, D. (2003). The many ways to search for a frog: Linguistic typology and the expression of motion events. In A. Strömqvist & L. Verhoeven (Eds.), *Relating events in narrative, Vol. 2: Typological and contextual perspectives* (pp. 219–257). Mahwah, NJ: Erlbaum.

Slobin, D., & Hoiting, N. (1994). Reference to movement in spoken and signed languages: Typological considerations. *Proceedings of the Twentieth Annual Meeting of the Berkeley Linguistics Society* (pp. 487–505). Berkeley: BLS.

Sperber, D., & Wilson, D. (1986). *Relevance: Communication and cognition* (2nd ed.). Harvard: Harvard University Press.

Talmy, L. (1975). Semantics and syntax of motion. In J. P. Kimball, *Syntax and semantics* (pp. 181–238). New York: Academic Press.

Talmy, L. (1985). Lexicalization patterns: Semantic structure in lexical forms. In T. Shopen (Ed.), *Language typology and syntactic description* (pp. 57–149). New York: Cambridge University Press.

Talmy, L. (2000). *Toward a cognitive semantics, Vol. 2: Typology and process in concept structuring*. Cambridge, MA: MIT Press.